Chapter 1
Introduction

Setting the scene and positioning the genome

This book is about the human genome in media cultures. It is about a shift from the singular Human Genome Project of the 1990s to the current plurality of genomes across media cultures. It follows the proliferation of genomes across multiple media sites, as human genomics finds audiences, markets and publics in everyday life. This book is not then about life of the genome under laboratory conditions, or its life in scientific journals, but it is about the genome under cultural conditions and in media cultures.

Consonant with a media approach, this introduction starts with an image that acts as a casting off point for the various directions that this book takes. A few days ago as I walked a trail on San Bruno mountain in San Francisco, (California, USA), I looked back to admire the views of downtown San Francisco. As I looked over the film-like towers of the city there motored over this already rather surreal scene, a zeppelin, also known as a dirigible or rigid airship. Once a familiar figure in the skies of Europe and the USA, airships have been out of the business of commercial and military air travel since the late 1930s. So what was this relic of the early twentieth century doing in the skies of one of the most high tech cities in the USA in 2009?

The 245-feet (or 75 metres) of white airship was adorned with the brightly coloured image of a pair of chromosomes and the logo '*23andMe*.com: personal genetics'. The zeppelin it seems is operating as an advertising space for the personal genomics company *23andMe*. (This company is examined in some detail in Chapter 2 so I am not going to discuss it here.) As I watched, the zeppelin motored off towards the Golden Gate Bridge disappearing behind the Twin Peaks hill that towers between San Bruno and the Gate.

I had already heard about the zeppelin because I've been researching *23andMe* since they opened for business in 2006, and friends in California, as well as commentators in the technology press, have mentioned it. This is how I was able to identify this otherwise anomalous feature of the skies. I was already orientated towards it. However, seeing the zeppelin provided a different orientation to that of just reading about it. The zeppelin is a very large and material symbol of much of what is going on at the media interface of human genomics and its audiences at the moment. It looms large but it is also peripheral. I am going to try and use the zeppelin to provide some sign posts, both of where I am going with this book, and where genomics is going with its publics.

Firstly, the zeppelin is absolutely intrusive and it forces attention by flying through the sky. It is an address and demands an interaction and in this way it could stand in for much of human genomics at the moment. The proliferation of sites at which human genomics appears seems unending. Like the zeppelin in the sky, genomics addresses a potential everyone. At the same time it is site specific. The zeppelin is in Northern California, flying over one of the biggest concentrations of information technology and biotechnology centres in the world. Images of it circulate on the web so anyone can see it, but it also has a here and now.

Secondly, there are multiple responses to the zeppelin, and it has multiple realities. Some people hate it and others love it. Some people haven't noticed it and others don't care about it. For some people it is just another thing in the sky, for others it is familiar as a zeppelin that has been in the area for over a year now, and for many the *23andMe* logo won't even register. The zeppelin is incontrovertibly material, it is also ephemeral and transient, predictable and unexpected. It casts a shadow. It provides a surreal, new weird aesthetic to a view of the city some days. Other days it is gone.

Thirdly, but in a similar vein, there are many different ideas about what *23andMe* and the zeppelin are doing. There are many different hopes, fears and questions. Are they doing new forms of surveillance or do they offer new promise? Are the right questions ones about access and governance, or are these just new forms of advertising and new snake oils? Is the zeppelin and its logo a weapon, or a technology of hope and liberation, or just a giant billboard? Does the zeppelin/*23andMe* partnership symbolise the potentially incestuous relations of technoscience and business in the area? Does it offer a promise of economic regeneration and employment in an area hit by recession, or is it just evidence of the elite getting richer and their toys getting bigger?

Fourthly, the zeppelin combines highly technologised imaginaries and materialities in the USA in 2009, with late nineteenth century technoscience in Europe. Like genomics, which traces its nineteenth-century roots to Gregor Mendel's work on plants in the 1860s in Austria, the zeppelin was designed in Germany in the 1870s. Genetics saw a period of implosion in the post-war period after its use in Nazi Germany was widely circulated. The zeppelin industry imploded after the Hindenburg air disaster of 1937. Despite mid-century disaster genetics was reborn through the iconic double helix as the new genetics of the 1950s. Genomics and the zeppelin are both seeing a twenty-first-century renaissance. The airship over San Francisco with its chromosome pair and promise of personal genetics is a sign of the times.

This book examines this sign of the times, and others like it, as part of the address of human genomics across media forms from airships to artworks. There is a sense in which the twenty first century is marked by the proliferation of such signs of biotechnology in everyday life. These can be tracked in contemporary media cultures of technoscience. These are marked by a convergence of the biological and digital, through a biodigital milieu of personal digital technologies. A review of recent journal articles and books in the humanities and social sciences

Figure 1.1 **The Airship Ventures Zeppelin with the *23andMe* logo in the sky in the San Francisco bay area (Photo: Javier Psilocybin, Santiago)**

would indicate that there has been a shift in the focus of academics, from the networked information and biotechnological ages of the twentieth century, into the biopolitics of the twenty-first century (Da Costa and Phillip, 2008; Rose, 2006; Rose and Novas, 2004; Novas and Rose, 2000; Franklin, 2000, 2006; Sunder Rajan, 2006; Thompson, 2005; Waldby, 1998). The meanings that the twenty-first century heralds has been harnessed to genomic and post genomic sciences by biotechnologists, media commentators and social scientists alike (Sunder Rajan, 2006; Guttmacher and Collins, 2003; Reardon, 2005). The twentieth biotech century of the gene (Bunton and Petersen, 2005; Keller, 2005; Rifkin, 1998; Yoxen, 1986) has phase shifted it seems into the millennium of post-genomic life. I am interested in what this moment looks like in terms of its media cultures and everyday production and consumption.

What is the genome incorporated?

Incorporation in this book figures as a way of thinking about how human genomics is taken up by people, and at the same time, how people are taken up into genomics.

If genomics forces attention by pushing into the available space, like the airship, what are the spaces it occupies and what kind of attention does it get? Incorporation is a figure for thinking about these ways that genomics moves in and out of bodies and spaces. The genome incorporated is a figure in a story that draws up several senses of incorporation, most obviously the meeting between the bodily and the economic.

On the one hand the genome is incorporated in sense of the embodied, corporeal habits and practices of the body. There is a multidirectional material and bodily choreography of incorporation. One direction of this incorporation is the extraction of bits of bodies. In this mode of extraction bodily samples are incorporated into genome projects, genome sequencing, gene chips, diagnostic laboratories, genomic data sets and testing apparatuses through the movement of saliva, buccal swabs and other tissue, skin and blood samples into laboratories. Genome projects thus incorporate body parts, ingesting them and rendering them as bioinformatic capital. However, such informatic genomes are also incorporated by individuals, they are taken up into bodily practices, knowledge and feelings in everyday life. Genomics also incorporates our attention. So for example, bodily behaviours such as food selection, exercise, and reproductive strategies made on the basis of attention to genomic information are forms of incorporation. Another vector for bodily incorporation is feeling or emotion, to be shocked, distressed or relieved by the results of a genetic test or genome sequence, such that the genome can be felt is another way in which the genome is incorporated. A further version of bodily incorporation might also extend to activism around genomics and biotechnology, for example the mobilisation of bodies in demonstrations around biodemocracy, biodiversity and biodevestation in the USA. In the UK and Europe, GM crops, eugenics, embryo research and the use of eggs in cloning have also provided sites of mobilisation. Such mobilisations are sites where incorporation is resisted and made visible, but also where the power of biotechnology to write into the fabric of cultural life is emphasised.

Some practices of body knowledge, through testing for example, offer a kind of preferred reading of the genome. These preferred readings, to draw on Stuart Hall's (1973) terms, occur when the address of genomics is taken up without disagreement. For example, to have a genetic test, and to understand ones identity as known through that test and to act on that knowledge provides the preferred reading for genomics. However, these preferred readings, whilst both ideal forms and subjective positions, are not the only reading of genomics. The address of genomics is contested and being remade all the time. Having a genetic test does not ensure the meaning of the test will be understood in one way. Testing has to be incorporated into people's lives to be made meaningful and people's lives may not be orientated towards a genomic account of themselves. For example, research on the take up of ancestry tests in genealogy shows that people often refuse to accept genomic information that disrupts their self-understanding, whilst information that reinforces existing accounts is more likely to be drawn upon (Smith, 2009).

Practices of body knowledge do not require testing however. The genome can be incorporated through mere address. Or in other words just by being in circulation. The so-called gay gene is a good example of an address that some people have taken up and incorporated into their identity, whilst others have resisted the address. At the same as the gay gene can be incorporated there is no gay gene test, just an argument that similar alleles in a particular area of the genome indicate a relationship to male sexual orientation (Hamer et al., 1993).

Another form of incorporation is economic, at one level a person buys a test, and a company makes a sale. The test moves into the life of the person, their tissues and money move into the life of the company. The genome incorporated (habitus) is also the genome inc. (economic). This sense of incorporation signals the genomic capacity for market applications, businesses, companies and corporations (Rose, 2001; Parry, 2004). Through economic incorporation the genome is taken up into the founding of biotechnology companies, health providers, diagnostic laboratories, media texts, artworks, pharmaceuticals, instruments, software programmes, t-shirt sales. The genome is incorporated in both economic and bodily senses through commodity value, market application and consumer interfaces. The regulation of testing, the making up of biobanks or genomic databases, the storage of materials, the counselling of people tested, the training of counsellors, the means through which testing was decided upon and how its results are interpreted are all part of this incorporation. At each point there are new opportunities for differing interpretations, contestation and resignification. This extraction of tissues in the mode of biocapital constructs genomic knowledge with an orientation to commodity value, market application and consumer interface. For DNA testing and genome sequencing to have a point of sale, a consumer market, it has to made more than informational, it has to have meaning, to be taken up into the everyday, to be felt, to become habitual, or part of the habitus in Bourdieu's (1977) terms. In these processes of incorporation genomics becomes destabilised as well as reinforced.

These two senses of incorporation, bodily and economic, cannot be separated out fully. There is extensive interplay between making genetic information meaningful through practices of body knowledge on the one hand, and the incorporation of genomic businesses, and the production of genomic goods on the other. The genome is incorporated in both these senses and this book, examines these intersections of body knowledge, attention, and economic value. The economic value of genomics we might call (after Kaushik Sunder Rajan, 2007 and Sarah Franklin, 2006), biocapital:

> Biocapital is one viewpoint from which to view the complexities of capitalism(s), and like all situated perspectives it contains within it both its specificities as well as its diagnoses of the more general structural features of capitalism. (Sunder Rajan, 2007: 7)

In his formulation of biocapital Sunder Rajan brings together Marx's attention to political economy, with Foucault's attention to biopower, in order to analyse the articulation of biocapital's 'life, labour and language' (2007: 14). An aspect of both capital and biocapital that Sunder Rajan foregrounds, and which might be helpful in thinking about the interplay of economic and embodied genomic incorporation, is the dialectic between material and abstract forms of capital. One of the contours of genomic biocapital is the materialisation of (bio)information and this generates commodity value. Thus genome sequences have direct value as objects. For example sequence information can be sold as a material object. *Knome Inc.* was selling full personal genome sequences, supplied on a data stick, at around $250,000 at the time of writing (spring 2009). However, sequence information also has value because of its relation to an abstraction or idea, such as the hope of a healthier future, and medical cures, or the idea of gene therapy. Sequence information, or gene chips for producing sequence information, also have speculative value as the product on which a company can be built. The speculative value of investment capital, or share value, is also an abstract value that derives from the material objects of the genome. The genome is economically incorporated in both material and abstract ways that determine each other. However, in addition to this flow of capital through biotechnology companies, patients, research subjects and clinicians, the attention and take up of wide audiences is another crucial aspect in shaping the value of biocapital.

Biocapital is one lens through which to look at genomic markets but media audiences offer a supplement to this. At the media interface, where audience attention is a key commodity, the genome also has both abstract and material values. The values of future hope, hype, imaginaries, and registers of feeling might be thought of as more abstract:

> once your complete genome has been sequenced, you will be able to stay current on future genetic discoveries as they become available. (*Knome Inc*.)

Like the promises of Genetic Health examined in Chapter 2, the sequencing company *Knome* promises a future realised in the here and now through the use of new biotechnologies and digital technologies together. These abstractions that bring the future into the present, are simultaneously determined by, and extracted from, the material forms that genomic information takes. These material forms include gel arrays, data sticks, databases, diagnostic brochures, genome browsers, and interfaces that narrate and annotate genomic information in relation to health, ancestry or lifestyle. These forms also include, websites, television programmes, films, books and other media texts, forms and artefacts.

The materiality of this abstraction can also be thought of in Donna Haraway's terms as material-semiotic:

> the imaginary and the real figure each other in concrete fact and so I take the actual and the figural as constitutive of lived material-semiotic worlds (Haraway, 1997: 2).

Having the data stick with your personal genome sequence (material) allows you, according to *Knome*'s claim 'to stay current on future genetic discoveries' (abstract). The offer of access to a genomic object, from sequence data to diagnostic brochures and interfaces, is an offer to incorporate both actual and figural, and thus constitute the factual. In this way incorporation might be thought of as the mode of address through which genomic forms are orientated towards consumers. Genomic incorporation operates as a factual mode of address, and the question becomes to whom is the address made, who attends to this address and takes up its facticity. In Judith Butler's (2005) terms (as well as Althusser's), we could ask who is recognised by the address. The 'who' of genomic incorporation is central to this project. Who takes up genomics, recognises it, is recognised by it? Who provides the preferred reading, and incorporates genomics, and who does not? Whose attention is drawn to these objects, who recognises them, who misrecognises them, who takes them up and who challenges them, or puts them down again? At the level of the structure of address genomic forms might be said to be similar. At the level of take up, readings, and differential incorporations, genomic forms are diverse. This in turn leads to a motivating question about the point of this kind of critique. What kind of difference does this diversity of incorporation make? To return to the image of the airship, as genomics pushes into the available space, what kind of difference does it make if people love it, hate it or ignore it? These kinds of questions are pursued in the following chapters of the book.

Media cultures of genomics: From iconography to incorporation

Genes ascending

Scholarship on the media cultures of genes, genetics and genomics has been marked by an attention to the symbolic ascendance of the gene. Twenty years ago in an article called '*Lifestory*: the gene as fetish', Sarah Franklin (1988) provided an analysis of a factual UK television broadcast on genetics – *Lifestory*. This was a Horizon special science documentary that dramatised the heroic discovery narrative of James Watson and Francis Crick's unveiling of nature through the construction of the double helix in the 1950s. Greg Myers also wrote about *Lifestory* in 1990 and in the following decade Jon Turney (1998), Pat Spallone (1993), Jose van Dijck (1998), Dorothy Nelkin and Susan Lindee (1995b), and Donna Haraway (1997) all contributed to a scholarship pointing to the iconic and fetishistic symbolism of the gene playing out in genetic media cultures. This symbolic power of the gene operated through the double helix, the iconography of which Sarah Franklin claimed was already in 1988 'etched on the modern Western consciousness' (1988).

In the intervening two decades, scholarship that deals with the representation of the gene on television, in the press, on film and in the arts has proliferated. There have notable analyses of these media cultures in recent years from Judith Roof (2007), Eugene Thacker (2005), Suzanne Anker and Dorothy Nelkin (2004) and Jackie Stacey (2010). In addition to this work on the symbolism of the gene as DNA and double helix, a renewed interest in code through the work of new media theorists (Anna Munster, 2006; David Berry, 2008; Adrian Mackenzie, 2006; Mackenzie Wark, 2004; Matt Fuller, 2008) both reinforces and challenges the old idea that DNA-as-code is the repository of all identity, 'the end to all stories' as Judith Roof put it (Roof, 2007: 2).

A shift in this period has occurred through the kind of address made. This shift is from iconography to incorporation. If we as media audiences have spent twenty years marvelling at the iconography of the gene (and only a few people have been), the current mode of address in the media cultures of genomics asks audiences for a more intimate gaze. The current address invites audiences to come closer and to interact with genomics, incorporating it into embodied practices. It is this shift from iconography to incorporation with which the book is concerned. The current mode of address in genomics (in the twenty-first century) has also shifted from foregrounding life to foregrounding death. Genomics on a mythic scale is attached to the meaning of both life and death (Keller, 1992). However, the previously overwhelming attachment to life, life stories and books of life (Kay, 2000) that characterised the ascent of the genome has now been annotated with an attention to modes of death. In a range of recent newspaper and television appearances genome sequencing and genotyping has been variously articulated as 'the doomsday test', 'the killer in me', 'how will I die?', 'can I take the worst?' Audiences are also addressed as though they can personalise the genome and incorporate it. Genomics may be the book of life but the mode of address is to 'know thyself' (*Knome Inc.*), and audiences are now asked to identify with and narrate a version of 'my genomic life' (Pinker, 2009). In this transition, in this context, the facts of life now also appear as the realities of death.

Genes descending

The ascendancy of the gene across multiple sites in the latter part of the twentieth century (Roof, 2007; Van Dijck, 1998; Lindee and Nelkin, 1995) did not add up to an accumulative leverage of symbolic power that can be exercised evenly. The gene maybe powerful but it is not overwhelmingly or simply deterministic. The meanings of genomics are constantly being made and remade under new conditions of possibility. These are always informed by what has come before, by the temporal operation of the human genome narrative over several decades, and the longer trajectory of the human gene narrative over the last century and a half. At the same time these meanings are also informed by the conditions of the sites in which they are currently being made. These conditions include forgetfulness or a

rejection of such narratives, amnesia, modes of attention and orientation that have missed out on the etching of the modern Western consciousness (Franklin, 1988).

An example of a current site in the making of these meanings is reality television. This kind of programming has both very specific characteristics and is incredibly flexible. However, the structure of the genre does not facilitate explicit connections to historical contexts, but relies on immediacy and the reality of feeling. The meanings of genomics are remade in reality television, especially in the shift from factual programmes about genomics to reality television that incorporates genomics, and this is examined in Chapter 3.

Some see reality television, as the very depths to which genomics could descend. However, by 1995 and 1998 Jose Van Dijck, Susan Lindee and Dorothy Nelkin had already highlighted the ubiquitous appearance of the gene in multiple popular sites, including cartoons, advertising and lifestyle magazines. One of the aims of their work was to examine the meanings of popular genetics, meanings that are made beyond the control of scientists, research projects and institutions. Importantly they also examined the interplay between popular and scientific meanings, concluding that the imaginaries of the gene were powerful, but limited, and both scientific and popular sites needed some kind of 're-tooling' of the imagination (van Dijck, 1995).

Another significant site in the mediation of genomics, and one that has also been characterised at times as the absolute sink of popular culture, is the internet. Arguably internet media are more prolific, more mutable and even more transformative than reality television could be. There are multiple ways to think about internet technologies in this context but I want to focus specifically on the interface of the browser – genome browsers. Browsers are private interfaces, with an entry price in the case of *23andMe* (of zeppelin fame), and open interfaces that are free at the point of access like the UC Santa Cruz, Genome Browser. One main difference between them is that *23andMe* is a new media company offering direct to the consumer personal genotyping through the web, whilst the UC Santa Cruz Genome Browser(s) is an interface to the generic human genome of the Human Genome project, and some non-human animal genomes. The latter is designed for use by science-orientated researchers, although there is little in the way of monitoring of use. Genome browsers offer access to sequence information of already sequenced genomes, whilst *23andMe* offers access to your own genotypic information. *23andMe* customers send in their fee and their saliva. In return they get an impressively annotated personal genome scan (genotyped at 580,000 SNPs), with links to diagnostic and ancestry information, as well as a sharing function and an option to contribute to scientific research. This kind of genome scanning, sequencing, genotyping and browsing is examined further in Chapter 2.

Another prolific media site and one that addresses large audiences, is film. Jackie Stacey's (2010) extensive examination of film in *The Cinematic Life of the Gene* provides insights into the current genetic imaginary as it plays out on in this form. Stacey discusses a range of Hollywood, independent and alternative films from the late 1990s *Gattaca* (1997) and *Alien: Resurrection* (1997) to the feminist

Teknolust (2003) and Michael Winterbottom's *Code 46* (2003). It is beyond the scope of this book to develop additional film analysis but this cinematic life of the gene intersects with the consumer interface of genomics and such genomic imaginaries also contribute to the kinds of incorporation examined here.

Art, even as public art, often reaches smaller audiences per project than Hollywood film. However, it often has longevity and operates in such a prolific multiplicity of sites worldwide, that it extends to large audience numbers. Genomic art has a long history of interest and investment. For many critics it has already operated as a form of corporate public relations for the genome project (Stevens, 2008). Although an incredibly diverse category, art also has a particular kind of cultural status. A traditional hierarchy of cultural production puts it above reality television for example. Art is seems is more serious, and it is attached to economic and institutional structures which help to sustain its gravitas, such as patronage systems, art galleries and arts councils. I am concerned with three overlapping areas of genomic art in this book, one is public art works created directly from sciart projects, or projects like them. In this area a number of projects have emerged that bring together scientists and artists in order to engage publics with science, and also in the hope that art might engage science. The second area is art works that have taken up genomics as their subject because of its interest for the artist, a particular community, or because of its general topicality as a subject. This might be termed genomic themed art. The third relevant area of genomic art is bioart, or tactical bioart. This latter area of the arts takes up biological materials, like bodily tissues, as the artistic media itself. In this area body parts and tissues such as skin, saliva and semen are part of the materiality of the artwork, and tactical bioart particularly is attached to a political agenda of activism (Da Costa and Philip, 2008). The work of bioart extends well beyond genomics and much of its more celebrated pieces are not in fact genomic. However, genomics is figured and strongly implicated in this area also. The turn to publics in the biosciences relates to the arts, which have become publicised and, like genomics, have proliferating audiences (McClellan, 2003). Public art has a high profile in the academy and more broadly as the business of culture, and art galleries are spaces of consumption (Prior, 2003). They have been enlisted in the projects of science education, public science, and making things public (Latour and Wiebel, 2005), that have become attached to the various global genome projects, and genome networks.

Latour and Wiebel (2005) curate an extensive project in their book collection and exhibition, *Making Things Public*. It evokes publics gathered around not just the terrain of politics but a myriad of other sites and objects. They point to 'atmospheres of democracy' beyond the public spheres of politics that include:

> new atmospheric conditions—technologies, interfaces, platforms, networks, and mediations that allow things to be made public (2005).

At the centre of their project is an imagined public constituted through things, or an argument that *things* make publics. In setting up the experimental exhibition

and book collection of the title, they generated and investigated the possibility of an assembly that corresponded to the *things* of their exhibition. They also offered the exhibition and book as additional things that might provoke publics into being. Their invocation of an assembly has a parallel to my argument that publics are usefully thought about through audiences. What Latour and Weibel's (2005) 'assembly' and my use of the term audience share is a commitment to a way of thinking about publics as groups who are orientated towards specific media technologies, platforms, artefacts or texts. They also share an attention to the technosocial constitution of these audiences and the corresponding apparatus of assembly, the assemblage, which combines technologies and bodies as collectives. Audiences are brought into being through an orientation to the media technologies to which they attend. The extension of media technologies across cultures, countries, spaces and times makes them public, both creating a ground for politics and in the sense of being open to view.

Publics and audiences

Claims that the dawning of a new era have followed the completions of the Human Genome Projects (2000–2003), and accompany the emergence of Personal Genomics. These projects also come with claims to the 'publicness' of genomics. Publics operate as at once the supporting other of genomics and its detractor. Claims to the publicness of genomics underwrite the significance of genomics and its power to mark the epoch – precisely because it is the public and social significance of genomics that is seen to be important beyond the sciences. Genomics, the claim goes, doesn't just change science, it transforms society, it is a social science, it has publics. The economic claim to markets is accompanied by a claim to publics. These publics were powerfully called into being in 2000 through the joint address by the then state leaders, President Clinton and Prime Minister Blair, on the occasion of the press release for the first of the human genome project's several 'completions' (Nerlich and Hellsten, 2004). The platform of world leaders addressing a global media public about an innovation in the life sciences, in the name of God and humanity, operated to sediment the 'gene as cultural icon' (Nelkin and Lindee, 1995b). In doing so, they also addressed a global genomic public through mass media circulation. Since that announcement genomics has shifted in terms of its address, from a singular form (the human genome), to the plurality of personal genomics, and at the same time its publics and audiences have become multiple.

Whilst providing the rationale for the significance of genomics, publics are also positioned as a potential threat, or an anti-public. Various publics are pre-constructed as either too interested or irrational or religious to be good genomic publics. These constructions of dangerous publics threaten to exclude the legitimacy of some people by assigning them as irrational, having a special interest, or as a 'lobby' (Haran et al., 2008). These exclusions generate a form of address where

those who are not on the side of the biotechnological object threaten the (public) benefits of genomics. These threats ensue, by definition (in the UK at least) from the irrational publics (Haran et al., 2008). Activist mobilisation is not encouraged, whilst purchasing genome tests is endorsed, the address of genomics is shaped by elite groups with an interest in preferred readings. However, the multiple publics that have come to attention are sometimes resistant to such control.

I suggest that current science and society relations are not in fact characterised by one type of science or another (informatics, genomics, proteomics, nuclear, and climate change sciences). That is, we are not in a genomic or post-genomic era, beyond very specific fields. We might be however, in a time characterised by publics on a more generalisable scale. An era of proliferating and contradictory publics, in which the apparently social and political questions of governance, knowledge, justice, security and the possibility of consensus, on the one hand, are played out through the consumption and regulation of apparently scientific sites, on the other. This publicness of the biosciences means that their meanings are contested in multiple spheres and the media operates as the ground and condition of making meaning, and securing authority around genomics.

If publics are the content and context of the matter at hand, then this shifts what might be fore grounded and back grounded in these debates. In this book I set out to position human genomics in terms of its publics, and audiences. The task is not to try and say this is wrong and that is right, but to examine how, in what ways and when is genomics taken up, supported, resisted, for whom and in which contexts? In other words, how and who are the publics of genomics, and how and who pays for, or gains from, their configuration as such.

In thinking about the publics of genomics it is important to think about publics as multiple (McClellan, 2003; Laclau, 2005). In other words it is not enough to say that there are is a distinct private versus public, consumer versus citizen, or lay versus scientific public. These are dynamic categories and there is no one way of thinking about the questions raised by the life sciences (e.g. no or yes to hybrid embryos). There are private publics, consumer publics, citizen publics, public scientists and many others. The task is to continue to try and account for the multiple contingencies of both refusal and agreement, and all those things in between. In this attempt at that task, the book examines the intersections of genomics and the media, at what could be thought of as the consumer interfaces, audiences, and publics of genomics.

Examining what publicness means is an important and difficult proposition and this has preoccupied much literature in political theory (Laclau, 2005; Fraser, 1990, 2000), in science studies (Durant, 1995; Wynne, 1995; Irwin and Wynne, 1995; Marres, 2005), and in media studies where the subjectivity of audiences has been a central concern (Lippman, 1925; Dewey, 1927; Livingstone, 2005; Couldry et al., 2007). At one level publicness refers to the constitution of a political ground in social and cultural life that is accessible, that is open to view, to access, participation, and to change. However, to be public, to experience publicness as a political subjectivity, also means to be recognised, to be able to recognise others,

to be orientated to forms of address, and to be able to address those forms and others. Focusing on the address (Warner, 2002; Butler, 2005) and on recognition (Fraser, 2000), as basic units of publicness, is a way of foregrounding the role of mediation in constituting publics.

Genomic incorporation is a mode of address that is offered to consuming publics, who can be differentiated, and homogenised in a variety of ways. For the genome to be incorporated it has to be taken up as embodied and economic ways in everyday technoscientific lifeworlds. Consumers are usually defined as people who buy goods, and this take up could be in relation to paying for a genomic test of some kind. Consumers are paying customers who have an economic relation to the object to which they are attached. They pay money for it, but they are still publics. This way of conceptualising people as consumers is often opposed to that of citizens who are understood to have a political relation to their object of attachment (usually a vote). However, studies of consumption also point to the political dimension of consumption, consumer activism – such as boycotting 'bad' companies – and the ethical consumer group movements (Hilton, 2003). Likewise studies of citizenship and political participation have also underscored the economic dimensions of voting behaviours and citizen consumption (Cohen, 2003; Scammell, 2003). All this is to say that consumers and citizens are theoretical categories that are considerably more complex when practised, indeed one of the features of capitalism might be said to be the complete mixing up of consumer and citizen (Lury, 2004).

The 'consumption junction' of science and technology is a particular site outlined in science and technology studies (Michael, 1998; Cowan, 1987). It has been used to articulate a relationship between technologies, and users and consumers. This articulation recognises consumers as agents in the shaping of technologies, rather than as the outsiders or lay audiences of science (Cowan, 1987; Oldenziel and Zachmann, 2009; Silverstone, Hirsch and Morley, 1992; Brown, 2003). Whilst the use of the term consumption junction stems from social shaping of technology, and domestication of technology debates (Cowan, 1987; Silverstone, Hirsch and Morley, 1992), Nik Brown recently 'revisited' this term to think about what he called the 'anticipatory publics' of science (Brown, 2007). In other research Mike Michael also takes up a discussion of the consumer in relation to technoscience (Michael, 1998). The consumer is relevant for Michael because it is the subjectivity of the consumer-citizen that orientates various publics towards technoscience. As every day users and purchasers they also become knowing evaluators of technoscience. Understanding the publics of science in this way challenges the assumption that publics are lay citizens who need to be either enrolled or educated. Brown and Michael's work positions publics as consumers who are already in an evaluative relationship with technoscience in multiple forms (Michael, 1998). Michael extends this argument in a book length project which situates the consumption of technoscience in everyday life. This and work on the domestication of technologies illustrates the complex, and intimate forms of take up and resistance in relation to home and work-life technologies (Silverstone,

Hirsch and Morley, 1992). This articulation of consumer and publics together offers an account of people that might be thought of as the active audiences of technoscience. Feminist accounts of technoscience have also emphasised the audience dimension of the sciences, drawing on the metaphor of the theatre (van Dijck, 1998; Haraway, 1997), not only the theatre of the playhouse but also of war and of surgery. These foci all point to the importance of an audience as a constituent in the making of scientific knowledges.

My central concern is the relationship between genomics as a structure of address, and the take up of genomics in everyday life. In this project it is useful to think of publics, beyond general publics, phantom publics, citizens, and consumers, as also being kinds of audiences. Publics as audiences are sought after and subject to both a communal and individual address in which they also have a reciprocal force to address. These different kinds of address are not evenly distributed, but audiences can be active, engaged, attending, consuming, absorbed, passionate, creative, commentating, chorusing, complaining, heckling, indifferent, resisting, distracted, absent and asleep. Membership in an audience is constituted through an orientation towards a form of address. This orientation is both individual and collective at once. It holds as both an individual experience and as a collective relation to the object, other audience members, or the time or the space of the mediation or address.

Nick Couldry raises the question of audience orientation in his collaborative work on media consumption and public connection (Couldry and Markham, 2008; Couldry, Livingstone and Markham, 2007). Couldry and his colleagues argue that the assumption that there is a link between media consumption and people's overall orientation to a public world needs to be re-thought. In challenging the assumption that media attention is linked to public connection (or some kind of participation in collective concerns) they move beyond what they call the 'presumption of attention' and in doing so draw on the language of 'orientation' (Couldry and Markham, 2008: 255). However, in this research Couldry et al. are primarily concerned with audiences' orientation to public connection that is somehow held to be outside of the media, 'the way in which you orient yourself to the world through media.' (Couldry and Markham, 2008: 261)

In this project I am interested in an orientation towards the media as a site in which public connection might be made, or fail (Here I am indebted to Sara Ahmed's work on orientation (Ahmed, 2006).) It might be helpful to take media audiences as publics orientated towards mediated technoscience, rather than seeing audiences as orientated towards the technoscience of genomics through media. A starting point for thinking about contemporary publics is their orientation as media audiences. Current mediated genomics offers connection to media artifacts, the mediating genome (Haraway, 1997), and the body as media (Thacker, 2004). Rather than to suggest that this connection is a closed circuit of media narcissism where connections to reality are lost, in the mode of Jean Baudrillard's simulation (1981), I would rather (re)open this presumption of closure and ask what these connections are. In other words the point here is not to get through media to an outside, or

centre, of public connection but to examine what connections are constituted through genomic mediation. This project thus attempts to take genomic media cultures in their own terms, rather than to read them as indicative of something outside of the media as though there were a world outside of mediation.

In the current digital media ecology the term digital publics helps to get at the way that publics are sutured into and appear as constituents of mediation. Digital publics are addressed through digital media forms. They address others, they are recognised, and they perform recognition. They make up the form of the address and speak back to it and to others about it. Digital publics are constituted through diverse, networked, always on, forms of address that demand a negotiation of an overwhelming overload of addressable forms. Thus, contemporary digital publics are orientated both towards openness and ways of managing selection and closure. Genomes are already digital media artefacts, as well as being vectored through media forms, and contemporary genomic publics are characterised by an engagement in critical digital media work. Contemporary genomics addresses its publics as personal, individualised and docile health consumers, whilst also constituting actively incorporated and publicly intimate bodies who intervene in the choreography of genomic incorporation.

Interactivity as a mode of address

The primary mode of address in contemporary media cultures is the offer and demand of interactivity. Media technologies like the internet, hand held devices, mobile phones, gaming, and digital media more generally, have a kind of interactive aura. That is to say that they seem to be originally interactive, or interactive from inception. They also seem to have brought with them the expectation of interactivity, which then extends to other forms (so-called passive forms) such as television, film, and radio, which are reconstructed as both digital and interactive. Despite the historical divisions between active and passive media forms, and analogue and digital media forms, it is possible to claim that the contemporary media ecology is characterised by interactivity and is digital, to some degree, across the spectrum. For example, print media forms such as newspapers may not be digital in terms of the material text (the newspaper) but digitisation is part of the production process, and often a digital form of the print version is also available through the web. Readers are invited, in the print forms, to interact via email or to blog in response to articles that they read.

Interactivity is both something offered by a media technology and is an audience response, strategy, or way of engaging with a media artefact. Some media technologies are said to just be interactive (the internet and computer games are examples), but whatever the technological affordances of a particular form, (to use Irving Goffman's language), the audience is also implicated in the 'inter' of interactivity. In other words interactive media are only interactive if activated. Interactivity thus might be better seen as a mode of engagement rather

than a property of an artefact. This might seem obvious but it is important to stress the relationality of interactivity. Making this point helps to clarify that a media artefact that doesn't seem interactive (or doesn't afford much interactivity) can also be experienced as interactive if an audience interacts with it. It is therefore the relation of 'inter' in which a phenomena of interactivity occurs. Genomes are digital media artefacts distributed in a mode of interactivity and demand and compel an interactive relationship and an active audience.

The meanings of interactivity have been debated throughout the academic literature on computer-mediated-communication (CMC), and digital media, (as well as elsewhere) and the meanings of interactivity are made in various different ways. Interactivity can be thought of as a technical form, as a property of communication, as a concept, as a discourse, as epistemology, and as ontology. Within CMC literature the interface is central. In relation to the interface, the meanings of interactivity operate at the order of the first three categories above: a technical form; a property of communication; a concept. As a technical form interactivity has often been used as a kind of measure or property of digital media, for example in designing or evaluating the amount of opportunities a web site afforded for user input.

In an attempt to bring the term under some kind of control Spiro Kiousis (2002) notes in his 'concept explication' of interactivity that 'theoretical and operational definitions are exceedingly scattered and incoherent' (2002: 255). In his article, which provides an excellent overview of the use of interactivity in CMC, he points to the way that interactivity has operated in two distinct ways, on the one hand it is understood as a property of a text or technical affordance (e.g. responsive touch screens), and on the other hand it is seen as residing in the perception or action of the user (does the audience touch the screen?). He concludes that interactivity is best understood as both a property of the media and the perception of the audience combined. Interactivity remains, in this explication, a discussion about the intersection of digital media and audiences engaging in something like interpersonal stimulus, feedback and response.

However, interactivity is more than a design feature, or a conceptual tool of new media studies, CMC, and other related areas. Interactivity operates as a discourse in a much broader cultural sense. Interactivity has become both advertising and policy for contemporary media ecologies. Andrew Barry, argues in a discussion of sites as diverse as the UK National Lottery, science museums, and digital technologies that 'interactivity is actually much more than a particular possibility inherent in the development of media' (Barry, 2001: 129). He goes on to argue that interactivity can be seen as something like a model for contemporary citizenship, and selfhood. Putting the model into practice offers a promise both for institutions and audiences. The promise in putting a model of interactivity into practice in science museums is:

> to turn the unfocused visitor-consumer into the interested, engaged and informed technological citizen. Interactivity is more than a particular technological

> form.(…) In an interactive model, subjects are not disciplined, they are allowed. (Barry, 2002: 129)

In Barry's analysis interactivity operates as a Foucauldian discourse in the constitution of subjects, not so much disciplining, but allowing subjects. This operation of interactivity as a disciplinary regime is examined in Chapter 2 through direct to the consumer genetic testing in the case of the Web 2.0 company *23andMe*. However, interactivity and its capacity for both empowerment and exploitation is a key theme of the book throughout.

Media scholar Mark Poster (1990, 1995) engages with interactivity as part of the production and constitution of contemporary subjectivity. He argues that the networked media cultures of the present produce an interactive, self-reflexive and fragmented contemporary subject, one that is different from the rational autonomous subject of the print cultures of the previous era. Poster, and others who take this position (e.g. Turkle, 1995), have been critiqued for taking an overly deterministic stance in relation to the technology. In other words they are seen as arguing that the media technologies of a period determine the possible subjectivities of a period. However, if we see interactivity as not just a technological affordance, but also a discursive formation, and a political economy of labour, it might be possible to avoid a reductive determinism (the technology makes us so). At the same time thinking about differentiated forms of interactivity is a useful tool for analyses of how life and media technologies emerge together and do different kinds of work on each other.

Interactivity is a form of labour, as well as taking technological and ideological forms. To become invested, interested and engaged, as Barry argues (2002), is a resource intensive process through which the attention of the audience is extracted. In an engagement with Whitehead, Bergson and Virno, Andrew Murphie (2005) extends interactivity as labour even further, situating it as central to 'the contemporary politics of the formation of labour.' (Murphie, 2005 unpaginated). In a section called 'Interactive Life', he takes up an approach where 'life itself is taken as interactive from the start.' For Murphie, in this argument, to live is to interact:

> To live then is to assemble and mediate interactions between what we might normally call 'living' and 'non-living'. (…) This very rough sketch suggests that interactive technologies are a matter of life (network drives, assemblage, the transductions of various forces, chemicals and so on) and death (archive fevers, disassembly). (Murphie 2005 unpaginated)

In biopolitical arenas such as genomics, organ and tissues trades, sex work, and biotechnology of all kinds, life is gathered up as interactive labour. Life is put to work. So for example the energy, bodies, and subjectivities of surrogate mothers are put to work in the surrogacy trade. Tissues are extracted, and remediated in organ and tissue transfer, and in the aggregation of tissue banks, DNA databases and so

on. What Catherine Waldby (2002) refers to as biovalue, Sunder Rajan (2007) as biocapital and Melinda Cooper's (2008) 'life as surplus' are the differentiated and unequal processes by which material, spatial, temporal, imagined and felt qualities of life are put to the work of economic extraction. Murphie's argument also points to the way that other forms of living beyond tissues and organs are also gathered up into the labour of biopolitics. These other forms of living include sensory attention, attachment to objects and artefacts and the interactive viewing capacity of the audience.

Tiziana Terranova (2004), along with others in the autonomous Marxist tradition, examines the kinds of labour operating in networked societies structured by media technologies. Ideas such as immaterial labour and free labour have become attached to the kinds of labour that operate for example in the current new media, 'Web 2.0' context. When participation becomes a demand and a responsibility (both what we are allowed and compelled to do), then what kind of labour is the work of providing DNA samples? These questions of labour are of central concern in the diverse literature on networked cultures, (see Shaviro, 2003; Rossiter, 2006; Terranova, 2004; Galloway and Thacker, 2007), as well as surveillance and interactivity (Andrejevic, 2004; Agre and Rotenburg, 1998; Phillips, 2007), and networked and digital media cultures more generally (Poster, 1990; Castells, 2000). Terranova's (2004) theories of network identity and labour and earlier work which forms the field, such as Donna Haraway's (1985) 'informatics of domination', share a concern with shifts in labour occurring across the intersection and integration of biotechnologies and information technologies throughout the latter part of the twentieth century.

Engaging with this literature, in the case of the consumer interface with genomics, I contend that interactivity is a kind of biopolitical labour that operates to offer audiences pleasure and empowerment, but which at the same time operates as a mode of extraction of value. This value is produced by engagement and interaction with the address of genomics. That is to say that interactivity is the mode through which audiences are asked to attend to genomics, and through which they can be constituted as 'the interested, engaged and informed technological citizen,' (Barry, 2001). However, a focus on the genome does not only operate as biopolitical, it also creates connections between diverse subjects, for example media audiences become connected to research subjects through an identification with the gay gene. This is mediation, a biodigital mode of connection, and it is not only about more biotechnological connections, because it is unpredictable as to what people will focus on. Interactivity is both a mode of extraction and a mode of attention, it is a demand, a pleasure and a compulsion. However, interactivity operates unevenly and unexpectedly and this book seeks to examine the different kinds of value created, and the different experiences of audiences, and producers, as they attend to, contribute to and intervene in genomic value. Interactivity, along with mediation is a central mechanism for genomic incorporation, but how incorporation can be differentiated might be what is important.

Biodigital identity

The term 'biodigital' is used in this book in adjacency to biopolitics and biocapital. Drawing on much of the same literature through which a theoretical framework of biocapital is built (Helmreich, 2008), this project also takes a slightly different turn. Biopolitics and biocapital are both taken up through frameworks that examine the bios, or bare life of contemporary capitalism. In this mode the life of animals, plants and humans alike is taken up as the 'raw material' of capitalism. Tissue cultures (Waldby and Mitchell, 2006), cell lines (Landeker, 2007), body parts (Dickenson, 2008), transnational surrogacy, egg trades and biotechnology more generally (Sunder Rajan, 2006; Cooper, 2007), are the driving force of a capitalism that has become biocapital (Sunder Rajan, 2006), a politics that has become biopolitics (Rabinow and Rose, 2006; Rose, 2001). However, the term biodigital offers an adjacent frame to this literature. It offers a way of reintroducing mediation, media technologies and media audiences into the biopolitical assemblage. Biodigital identity is a mode of identity construction that at once acknowledges the phenomena that produce biopolitical relations, whilst offering an adjacent and perhaps interstitial space. Ultimately the construction of biodigital identity through genomics is another sign of the highly technologised lifeworlds that people live in. However, it is also sign of just how ordinary biodigital identity is. In order to clarify what that adjacent space might open into I offer here a selective overview of the circulation of the term biodigital.

Nigel Thrift uses the term biodigital in relation to Luciana Parisi's project on 'abstract sex':

> Here we have, in other words, a biodigital politics in which 'the body is no longer determined by individual qualities constituting the difference between animal, human and machine'. (Parisi, 2004: 137) (Thrift, 2007: 166)

Nigel Thrift engages with Luciana Parisi's project on 'abstract sex' to discuss a new politics of sentience that could be characterised as biodigital. In his discussion of 'technology, biology and space' (2007: 153), Thrift outlines the politics of an 'informed materiality' (2007: 166) where 'technology has moved so decisively into the interstices of the active percipience of everyday life that it is possible to talk of a new layer of intelligence abroad in the world' (Thrift, 2007: 166). This new layer and this informed materiality, a materiality that is already informational, computational and interspecies amounts for Thrift to a new spatial politics, a politics of the biodigital. Although this is a rich discussion I depart from both Thrift and Parisi because I am not proposing the biodigital as a totalising respatialisation or a new ontology. However, thinking about the ways that audiences negotiate biotechnological and digital convergences, does open up a space for thinking about take up, negotiation and resistance to a biodigital address.

In *Abstract Sex* Luciana Parisi proposes the biodigital as a layer in a stratification of what she terms 'abstract sex'. Abstract sex, for Parisi, is a philosophical thesis on modes of production and reproduction. These modes she explains are three aggregating strata starting with a 'biophysical' bacterial mode of reproduction, a 'biocultural' human mode of reproduction and finishing with a late twentieth century 'biodigital' strata of molecular and recombinant reproduction. In Parisi's philosophical model bacterial is the primal soup, biocultural is now and biodigital is the future. These strata are overlaid in complex systems of becoming in which the biodigital is an assemblage of digital and biodigital cloning. These biodigital bodies, although future bodies, still 'map the tendancies of the bio-informatic phase of capitalism' (Parisi, 2004: 195). This kind of formulation is itself an imaginative address by Parisi inspired by her own negotiation of biological and digital convergence, and her work can be read as a symptom of a kind of biodigital poetics, a sign of the times.

USA-based media artist, activist and scholar Eugene Thacker also uses the idea of informed materiality that runs through Thrift and Parisi, to articulate a theory of 'biomedia' (2004). Biomedia in Thacker's terms is similar to Thrift's biodigital in that it points to an informed materiality, and Parisi's biodigital strata in that it foregrounds recombination and remediation. However, Thacker is much more specific about the kind of technology that he is analysing. In a form of digital media analysis Thacker argues that digital media are a kind of biomedia through which information is embodied and bodies are informed in a simultaneous and recursive movement through which bodies and information flow. If information lost its body in Katherine Hayles' account of 'how we became posthuman' (1999), Eugene Thacker's theory of 'biomedia' re-embodies information. Information is corporeal and bodies are informatic in Thacker's account of the relationship between bodies and digital media, they flow into each other, remediating each other in uneven and sticky ways. Thus, Thacker's biomedia, as another sign of the times is a more useful version of the biodigital, for my project, than Parisi's because it foregrounds mediation bringing media technologies and biotechnologies together.

In his examination of Lynn Hershman-Leeson's film *Teknolust* Jussi Parikka (2007) also deploys the term biodigital. In Parikka's analysis the biodigital is closer to Eugene Thacker's examination of biomedia than the more abstract rendering of Parisi. For both Thacker and Parikka biodigital signals an integration of people and machine through those media technologies that remediate bodies. These forms include The Visible Human Project, The Human Genome Project, DNA databases, and multiple digital media forms, which remediate bodies, or in Haraway's terms 'corporealise' information (1997). For both Thacker and Parikka biodigitality is bound up in media technologies and it is this inflection or focus of the term that is important for me. Although Parisi's thesis is extensive, it is also too abstract for my purposes. In examining the contours of the construction of biodigital identity, I focus on the somewhat more mundane consumer interface produced through the intersection of digital media technologies and bodies, the consumer interface

of human genomics. This biodigital interface is at once a formation of biomedia, corporealising information and enframing bodies in the form of genome browsers; and a mode of engagement with biodigital cultures through multiple media forms. Thus, processual public art projects, broadcast television, and film, also open into this interface. The consumer interface of human genomics is a cluster of sites through which human genomics is incorporated through publics, realities and imaginaries, economies and identities.

Layout of the book

This book engages with the literature briefly outlined so far and takes up the questions of genomic incorporation: when, where and how is the genome incorporated and what different kinds of genomic incorporation operate in the contemporary media ecology? Interactivity, mediation and embodiment are central themes that run though the different sites explored here.

The second chapter 'The Genome and Me' takes up the discussion of labour and interactivity in an examination of *23andMe*. This new media biotechnology company combines Web 2.0 structures with the genome by offering direct to the consumer genotyping via the web. Part of the product is *23andMe*'s interface which operates as a browser, part social networking technology, part genomic database, part research archive. This company, and others like it, have emerged in the last few years under the banner of direct to the consumer genetic testing. Most of them are embedded in the informational and biotech economies of California, whilst also having global reach. They too have emerged through contemporary discourses of interactivity, with their powerful promise that interactive media both offers pro-active participation and democratises consumption. *23andMe* provides a site in which individual consumers can buy a stake in the digital mediations of the genome to which they simultaneously contribute in the form of samples. These are then sold back to participants along with a tailored genome browser that allows them to view their genome sequence as digital media content. This browsing format enables participants to 'connect' with 'similar' genes, genomes, or patient and other interest groups. New social networks of genomic communities are offered for the consumer to constitute through membership. The promotional cultures and investment in sales of personal genome sequencing are generating new forms of consumption, as well as new kinds of science.

The third chapter, 'Reality Genomics', looks at a genomics/media partnership in the form of a UK reality television programme *The Killer in Me*. Reality TV restyles factual and fictional boundaries and re-works genomic knowledge through this restyling. This chapter examines the relationship between the reality category in reality television on the one hand, and genomic incorporation on the other. It offers an analysis of the responses that played out in the UK, the way that the genome is made meaningful in everyday life, and it the kinds of boundaries that this meaning making reinforces, creates and disrupts. Genre, form and content are important

in this part of the book and are used to trace the layers of intelligibility operating in this form of genomic consumption. The chapter builds up a framework for examining the specificity of genre and form whilst thinking about the connections across other areas in which human genomics is topical.

The Killer in Me exploited the topicality of human genotyping, linking it to age related health care. This topicality had in part been staged through a set of articles in the UK press, generated by, and involving the company Genetic Health™. The UK's Independent Television Productions (ITV) partnered Genetic Health in a one-hour lifestyle programme that followed four celebrities as they took the 'pioneering' genetic tests and were given information about their future health.

The 'Reality Genomics' chapter examines the programme, the ensuing complaint from the British Society for Human Genetics (BSHG), and the outcome of the investigation by the UK communications regular Ofcom. The question of what kind of reality is at stake in reality genomics structures this chapter.

The fourth chapter examines art and genomics in the form of sciart collaborations that have accompanied genomic research in the early twenty-first century. Investment in sciart in the UK has been significant and globally art has become an important vector for genomics. This chapter is based on an analysis of a selection of art works, sciart projects, and bioart combined with research interviews with a variety of artists in this area. This analysis is situated within a critical appraisal of literature around sciart and bioart. The chapter traces the emergence of DNA, genetic, and genomic art and examines Suzanne Anker and Dorothy Nelkin's (2002) work in cataloguing art in this area. It offers a supplemental genealogy of bioart and in doing so offers an intervention in debates about sciart and bioart and their role in the production of knowledge in this area. A key figure in these debates is the trope of C.P. Snow's 'two-cultures' lecture, and the work that this does is examined as an important structuring element in engagement, funding and organising genomic art.

Chapter 5 is an analysis of sexuality in the genome. This is organised through a case study in which audiences are called upon to identify with contemporary genomics through the *How Gay are Your Genes?* Project. This project emerged as a science communication project at the Policy, Ethics and Life Science research centre (PEALS) in Newcastle, UK 2005–06. The project used the 'gay science' of Hamer and Copeland (1994), and later studies on genomics and sexuality, to address the question '*How Gay Are Your Genes?*' The project involved interviews with the local LGBT communities on their ideas about how LGBT identity is formed. A series of events and writing workshops occurred, followed by an art exhibition commissioned for the project. This project provides a catalyst for examining the issues at stake in both the science of sexuality, and in community based explanations of identity. It also provides an example of a sciart project with a difference. It returns to some of the issues raised in earlier chapters about the relationships between art, science and publics, as well as providing an opportunity to reflect on the relationships between genomics and other narratives of identity.

A hybrid form of science media, *How Gay are Your Genes?*, shows how human genomics is not only a mediated science (Haran et al., 2008) but a site where mediation, science and identity are incorporated in an address. Importantly, this site shows both the preferred incorporation of human genomics at work, and also demonstrates how resistance, critique and intervention can be at work at the same time. This case is an example of where people take up the narratives from the genome and incorporate them as identity narratives, but also where people critique, resist and intervene in the same narratives. It also signals a shift in take up of genomics over time, where the gay gene saw critical coverage (Kitzinger, 2005), and was embraced in the 1990s by gay men in the USA (Rosario, 1997), its address has become a site of unease for many people who identify as lesbian, gay or trans in the early twenty-first century.

A note about critique and engagement

This project is an examination of public engagements with human genomics. It is an attempt to put such engagements into a broad critical perspective. This kind of engagement is an attempt to make visible some of the power relations of genomics and their publics, and to bring to light some of the different kinds of engagements, resistances, refusals, and excesses of genomic incorporation in everyday life.

The Genome Incorporated comes from a British Cultural studies tradition as it intersects with feminist cultural studies of science and technology (McNeil, 2007). It is concerned with the way that meaning is made in everyday life and with who and what has the power to make and materialise such meanings. Such meaning–making structures ideas about what is true, what is real, what is factual and how people should organise their lives in relation to such truths, realities and facts. Whatever the facts of genomics, as far as genomic science is concerned, it is how media cultures of genomics are currently offered, taken up and understood in everyday life that makes it meaningful, real and valuable – in felt, imagined, material and economic terms – for both the audience-consumers of genomics and the producers of genomic knowledge and products. The following chapters trace out these differential offerings (modes of address) take up (consumption), and understandings.